

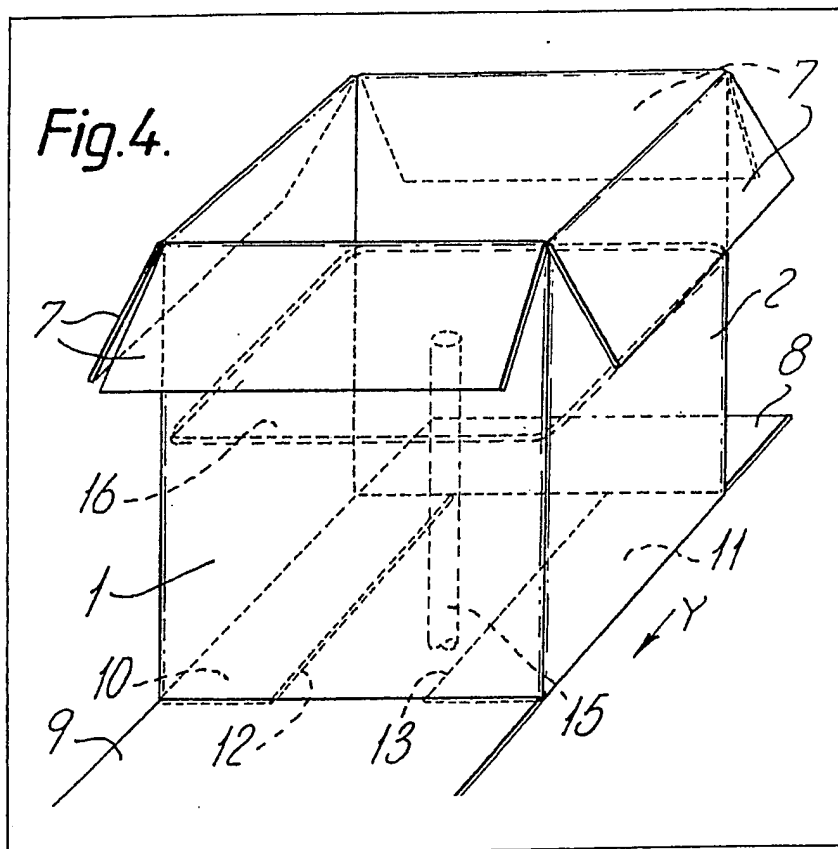
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## (54) Packaging articles in layers in a carton

(57) Articles are packaged in layers in a carton having rectangular top and bottom ends and flaps for at least partly closing one of said ends. The carton is positioned at a loading station with said end facing downwardly and with a vertically movable pillar (15), carrying a top plate (16), extending upwardly therethrough. A first layer of the

articles is assembled upon a first article support which is so dimensioned as to cooperate with the carton in retaining the articles in said layer, and supplied to the top plate (16). The assembly is then lowered to retract it downwardly into the carton. A succession of further assemblies is piled progressively upon the first with progressive lowering until the first article support engages with the flaps. The filled carton is then removed from the loading station.



GB 2 098 570 A

1/4

Fig.1.

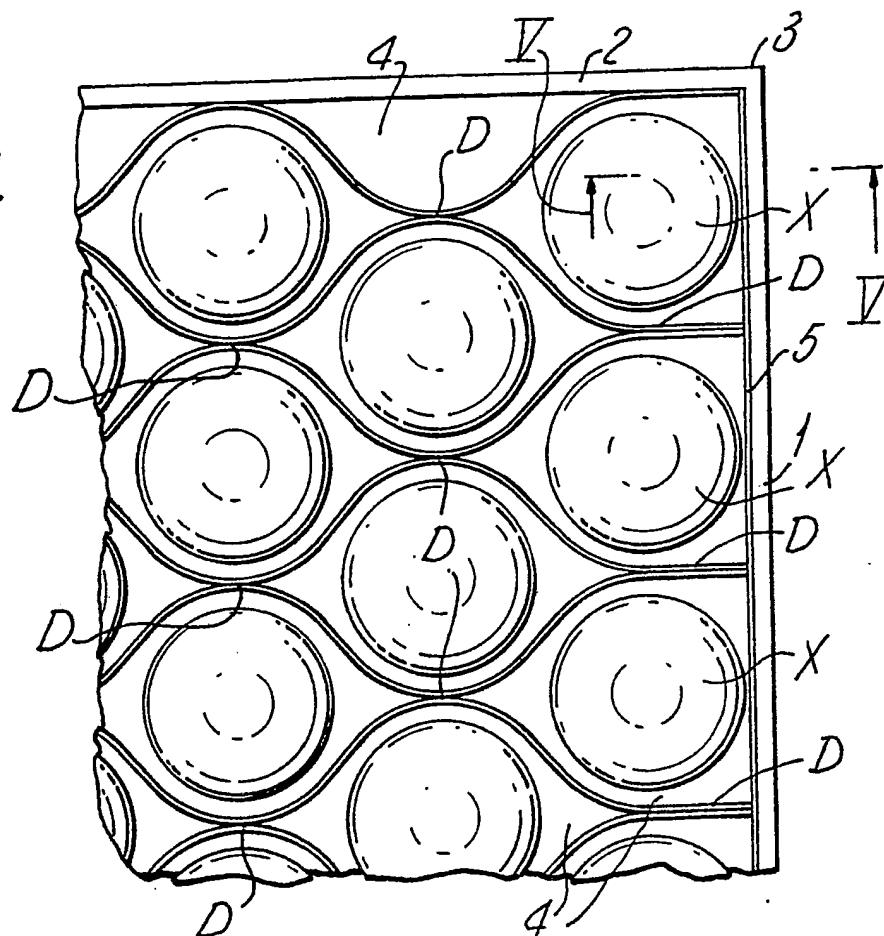
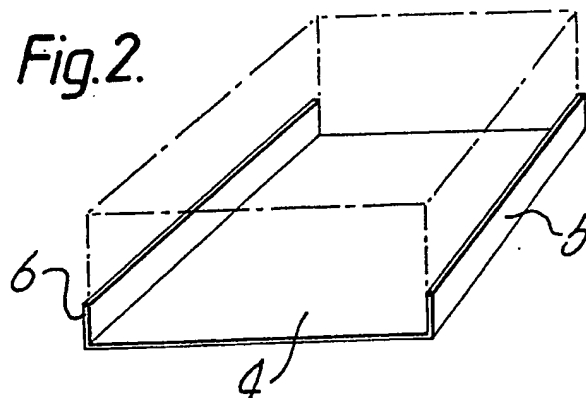


Fig.2.



2/4

*Fig. 3.*

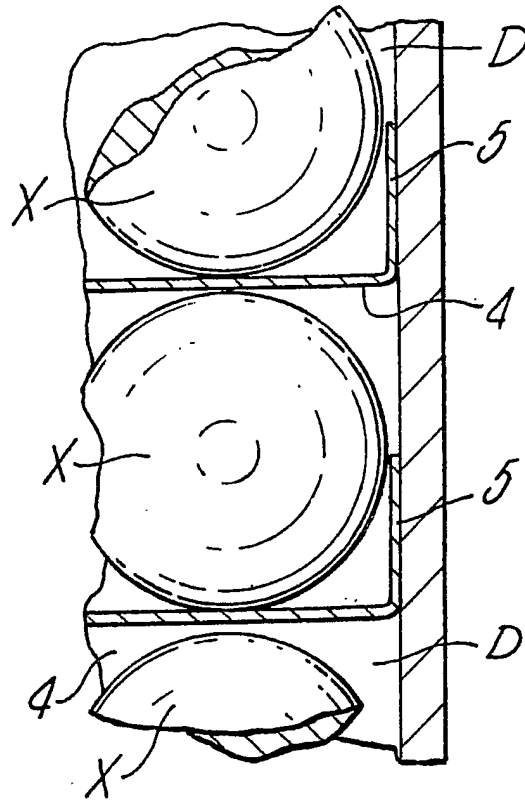
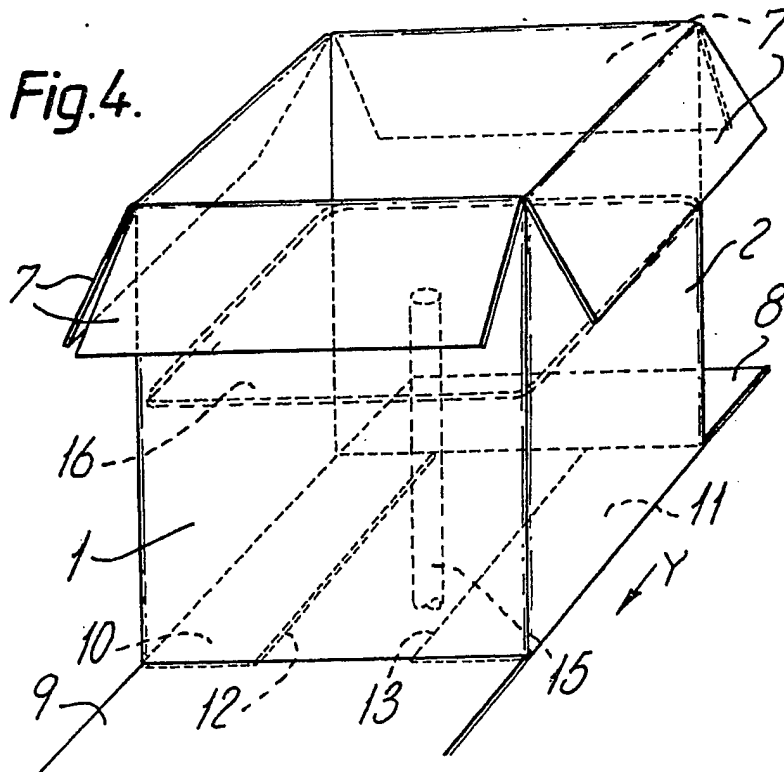
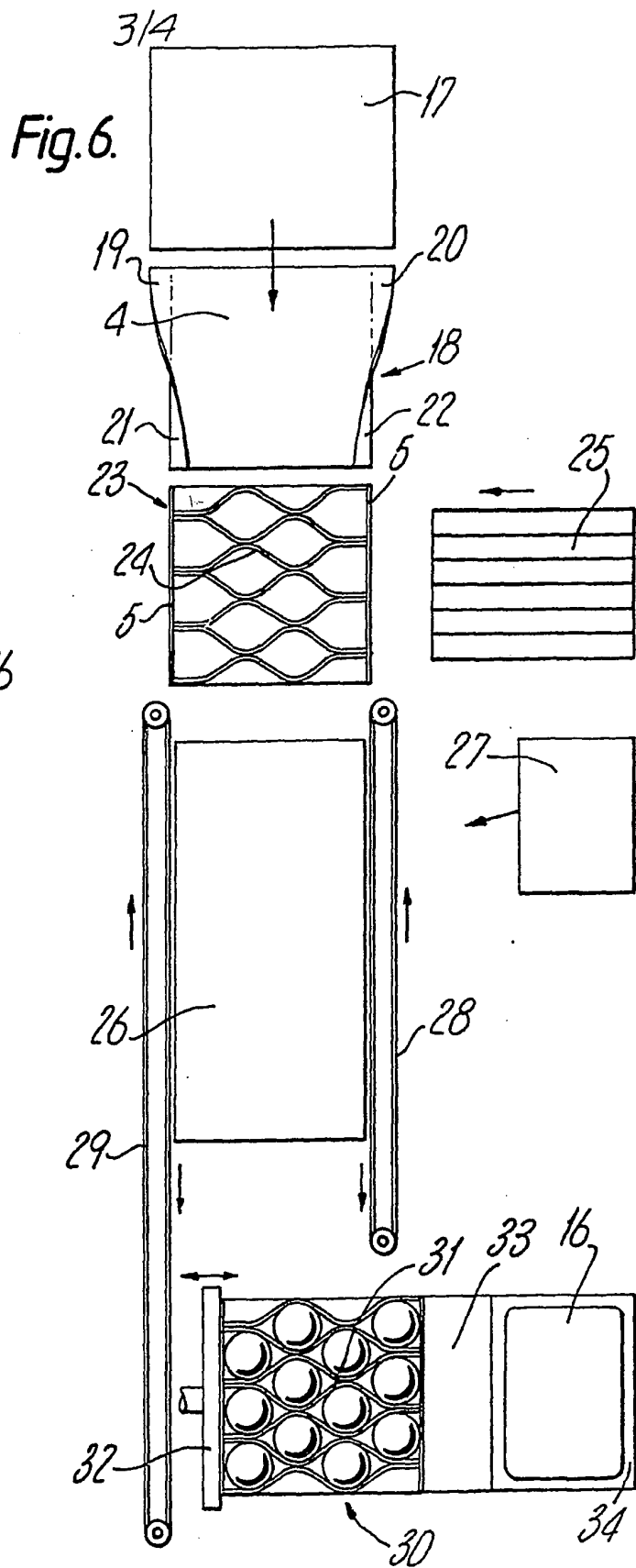
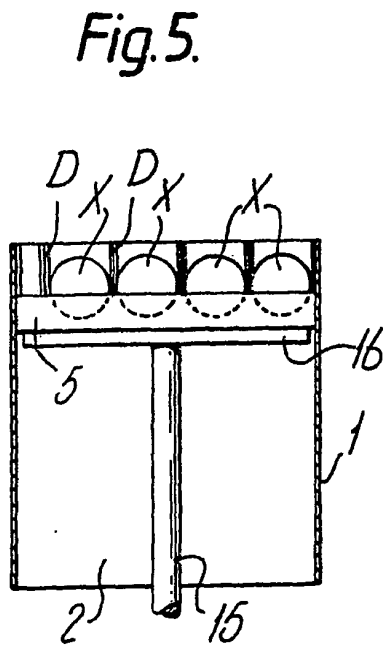
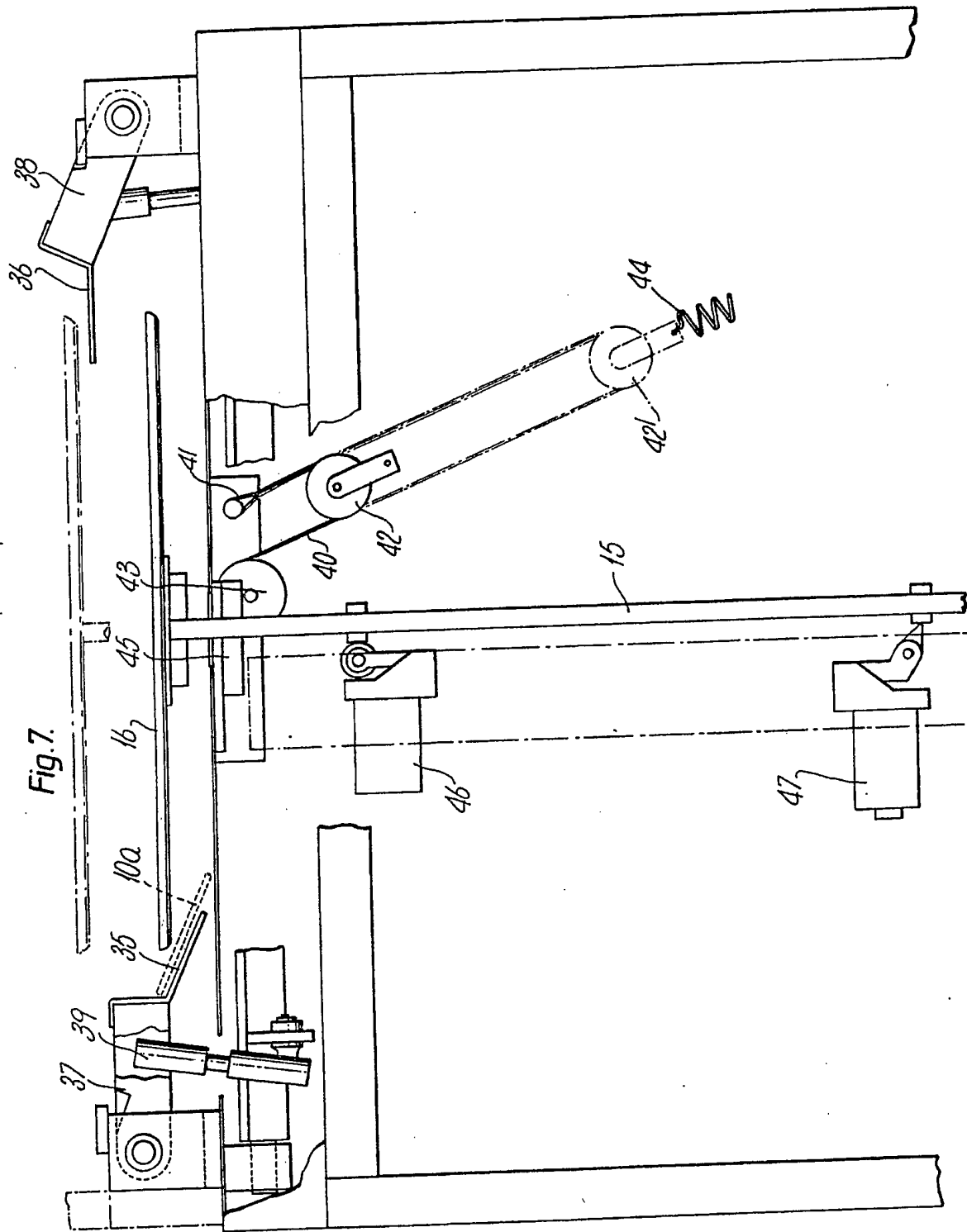


Fig.4.





4/4



## SPECIFICATION

### Packaging articles

The present invention relates to the packaging of articles.

5 In accordance with the present invention, there is provided a method of forming a package of the kind in which articles are positioned in layers in a carton, which method comprises taking a carton having side walls which define a rectangular top  
10 end and a rectangular bottom end and flap means for at least partly closing one of said ends, positioning the carton at a loading station with said end facing downwardly and with jack means extending upwardly therethrough, positioning a first layer of  
15 the articles upon a first article support which is dimensioned to fill the rectangular cross-section of the carton at least sufficiently to retain the articles in said layer and which is located adjacent to the other of said ends by the jack means, lowering the  
20 jack means to retract the article support and the layer of articles thereon downwardly into the carton, piling a succession of further layers of the articles and article supports upon the first layer with further lowering of the jack means and  
25 eventually engaging the first article support with said flap means and removing the carton from the loading station.

Positioning articles in layers with an article support for each layer, and lowering the layers and  
30 their supports into a carton in a controlled manner avoids impact damage to the articles as well as preserving their layer arrangement. Controlled descent during the lowering has been achieved by so dimensioning the support that the air within the  
35 carton is compressed to provide a cushioning effect. Good results have been obtained in this manner subject to maintaining the cartons and the supports to within the required range of accuracy and configuration. In practice the horizontal cross  
40 section of the cartons tends to vary from the rectangular and the avoidance of distorted cartons and correct positioning of the supports preparatory to descent both require close continued attention. In another arrangement,  
45 mechanical lowering has been obtained by positioning the support for the first layer upon a set of pillars which are retracted downwards as required, a set of holes for penetration by the pillars being formed in the bottom end of the  
50 carton. Reliable packaging is obtained in this manner.

The reliability is retained in the method of the present invention without providing the holes. Ready access of the jack means which can be  
55 dimensioned to engage the first article support over a substantial area, or virtually the whole thereof, is achieved in a simple manner. After the carton has been filled, the flap means is bridged by the first article support.

60 Various formations of the flap means may be employed, the preferred form being constituted by a pair of flaps extending from opposite sides of the carton. A normal practice is to invert the carton for the filling operation. The last layer introduced

65 eventually becomes the bottom layer. This is convenient when the packaged articles are to be sold by weight since a final adjustment of weight can be made by adding articles to or removing them from the (future) bottom layer. Hereinafter  
70 the end uppermost in the packaging operation, will be referred to as the bottom end and the other end as the top end.

A preferred formation of the flap means is a pair of flap extending from the sides of the top end.  
75 They may be rectangular flaps, preferably equal in size. They may be dimensioned to leave a gap therebetween and further flap means may be provided for final closing of the gap after inversion of the carton to its upright position. This further  
80 flap means may be constituted by a pair of rectangular flaps which extend from opposite sides of the carton and are dimensioned to enclose the top end completely. Closure flaps may be provided for the bottom of the carton as well as  
85 for the top. The arrangement of the flaps may be the same in each case.

In a preferred form of the method, the articles in each of the layers are located in the cells of dividers formed of structural honeycomb material,  
90 and the article supports are layer pads. This honeycomb material can have its thickness dimension so selected that it, rather than the articles therein, carries the load.

According to a feature of the invention, the  
95 layer pads are rectangular pieces of card material and at least one of the edges of each layer pad which runs in the expansion direction of the divider is upturned to form a flange. Such flanges can perform two functions. Firstly they provide a  
100 stiffening of the layer pads which (a) assists them in carrying their load and thereby increases the reliability of support by a jack means having a discontinuous lifting surface and/or having a significant clearance with the interior of the carton  
105 and (b) increases the stability of assemblies of layer pads, dividers and contained articles formed at a filling station (as in a preferred form of the method of the invention) and conveyed, as such, to the carton in succession. Secondly where, as in  
110 normal packaging practice, some of the articles of the layer are located in incomplete edge cells of dividers, the articles can be retained therein by the flanges.

The method of the invention is readily  
115 applicable to automated packaging. In a preferred example thereof, the layer pads are drawn in turn from a supply of flat cards and conveyed to a fitting station, the flanges are formed during said conveying and the dividers are drawn in turn from a supply of dividers in the unexpanded state and  
120 expanded and fitted upon the flanged dividers at the fitting station.

In the operation of the method, the descent of the jack means is preferably opposed by an elastic loading. This is a simple and effective arrangement because the downwards movement of the jack means is proportional to the weight supported thereby. Using a tension spring for the elastic loading, the design of apparatus is facilitated by

adopting an arrangement in which the velocity ratio is changed, conveniently by a cord or wire in association with one or more pulleys. For most purposes a single pulley attached to the spring is sufficient.

A pneumatic arrangement may be provided for extending the jack means preparatory to the filling of a carton.

The following description in which reference is made to the accompanying drawings is given in order to illustrate the invention. In the drawings:

Fig. 1 is a plan showing part of a packaged carton produced by the method of the invention,

Fig. 2 shows a layer pad as introduced into the carton,

Fig. 3 is a vertical cross section of part of the packaged carton taken at V—V of Fig. 1,

Fig. 4 is a perspective showing the configuration of the carton when ready for filling,

Fig. 5 is a diagram showing a stage in the filling of the carton,

Fig. 6 is a flow-sheet showing the general layout of apparatus for filling the carton, and

Fig. 7 shows part of the apparatus employed in further detail.

Fig. 1 shows, in idealised form, the corner of a layer of apples packed in a cuboid carton having vertical walls 1 and 2 which meet in a vertical corner 3. This layer, together with an expanded divider of the honeycomb type, shown with its walls of double thickness marked *D*, rests upon a layer pad 4 formed with a pair of flanges 5 and 6 which assist in retaining those apples marked *X*, occupying incomplete edge-cells of the divider in position during the packaging operation.

The layer pad and the divider can be regarded as defining the top, bottom and sides of a cuboid structure whose thickness extends above the flanges 5 and 6 as shown by broken lines in Fig. 2. In the orientation shown in Fig. 2 the top of the structure is as defined by the top edges of the divider (not shown). This top supports superposed layers (Fig. 3) in the package and protects the apples from compression. Deeper flanges than those shown may be provided for the purpose of isolating the apples from the walls of the carton.

As shown in Fig. 4, the top and the bottom edges of the walls of the carton, which is shown inverted for filling, have integral closure flaps. Bottoms flaps 7, are open as shown in Fig. 4 for filling. They are closed after filling and stapled or otherwise strongly secured before the carton is turned upright.

For the filling operation the flaps 8 and 9 of one opposite part of the top flaps which extend from the wider sides of the carton are positioned to project outwardly and those 10 and 11 of the other opposite pair are directed inwardly to leave between their adjacent edges 12 and 13 a space 14 which extends across the whole width of the carton. This space admits the pneumatically operated pillar 15 of a jack having a top plate 16 dimensioned to fill the cross section of the carton loosely.

Apparatus of the type shown in Fig. 6 may be

employed for providing a series of assemblies each consisting of apples contained in the cells of dividers superposed on layer pads. The layers pads 4 (which may be formed of chipboard, e.g. of

grade 150 to 300 grams per square metre, e.g. 210 g) are drawn from a supply 17 in turn and passed at 18 through a creasing device where the edge portions 19 and 20 pass through dies which progressively fold them through 180°, creasing them sharply at 21 and 22. On passing from the creasing device to a fitting station 23, the resilience of the layer pads swings the folded-over parts about the creases to form flanges. A divider 24 is drawn from a stock 25, expanded and fitted upon the divider at station 23. An endless conveyor (not shown) moves the flanged layer pads and their dividers through a filling station 26 where apples drawn from a source 27 are loaded into the complete and incomplete cells. Boundary belts 28, 29 assist the flanges in retaining apples in the incomplete cells.

From loading station 26 the assemblies are passed to an unloading station 30. The conveyor moves stepwise and when it is halted the assembly 31 at station 30 is pushed by a reciprocating pusher 32 over a slideway 33 and thence over a frame 34 positioned over an awaiting carton.

This carton is positioned, as shown in Fig. 7, by sliding it into position on the top of an actuating assembly where it is held between a pair of channel members 35 and 36 mounted upon pivoted arms 37 and 38 arranged to be raised and lowered pneumatically. The pneumatic actuator for member 35 is shown at 39 in Fig. 7. The carton is slid into position with the flaps 10 and 11 inclined, as shown for flap 10 at 10*a*, so that they pass under the top plate 16 of the jack. It is then raised by raising arms 37 and 38 shown respectively in the lowered and raised positions in Fig. 7 for convenience of illustration. Raising the carton brings it into operative engagement with the underside of frame 34. As the carton is raised, the pillar 15 is raised pneumatically to bring top plate 16 level with the open bottom of the inverted carton to receive the layer pad and its load.

Loading of the jack (15, 16) with the pneumatic raising gear inactivated, tensions a cable 40 secured by one end at 41 and passing round a movable pulley 42 and a fixed pulley 43 to be attached by the other end to pillar 15 adjacent to the bottom thereof. This loading tensions a helical spring 44 attached to pulley 42 (shown at 42' in its position when plate 16 is fully raised). Descent of the layer pad and its load of apples is opposed by the spring and the tension balances the load when the layer pad has sunk sufficiently from the carton to receive the next layer pad. The procedure is continued until the carton is filled. Damping of the downwards motion is achieved by a friction pad device at 45.

Pneumatic valves actuated by abutments on pillar 15 are shown at 46 and 47.

When the filling is completed, arms 37 and 38

are lowered to bring the inwardly-directed parts of channel members 35 and 26 into a downwardly inclined position. Flaps 10 and 11 are partially released (see 10a in Fig. 7) enabling the carton to be slid in direction Y (Fig. 4) clear of plate 16 and replaced. The filled carton may be lifted by an unskilled operator engaging the flaps 10 and 11 with the fingers of both hands. At this stage, the flanges of the layer pads provide stability during any movement of the flaps 10 and 11 as well as (previously) retaining the apples in position during the transfer of the loaded layer pads from the conveyor to the frame 34.

After closing the bottom by securing the flaps 7 in the closed position, the carton is turned upright and closed at the top by flaps 8 and 9.

It will be understood that various departures can be made from the arrangements specifically described by way of illustration without departing from the scope of the invention.

#### CLAIMS

1. A method of forming a package of the kind in which articles are positioned in layers in a carton, which method comprises taking a carton having side walls which define a rectangular top end and a rectangular bottom end and flap means for at least partly closing one of said ends, positioning the carton at a loading station with said end facing downwardly and with jack means extending upwardly therethrough, positioning a first layer of the articles upon a first article support which is dimensioned to fill the rectangular cross-section of the carton at least sufficiently to retain the articles in said layer and which is located adjacent to the other of said ends by the jack means, lowering the jack means to retract the article support and the layer of articles thereon downwardly into the carton, piling a succession of further layers of the article and article supports upon the first layer with further lowering of the jack means and eventually engaging the first article support with said flap means and removing the carton from the loading station.

2. A method according to claim 1 in which said flap means is constituted by a pair of flaps extending from opposite sides of said one of said ends.

3. A method according to claim 2 in which the flaps are dimensioned to leave an access gap therebetween.

4. A method according to either of claims 2 or 3

in which the flaps are rectangular flaps.

5. A method according to any one of claims 1 to 4 in which said one of said ends of the carton has closure means for closing the access gap after the removal of the carton.

6. A method according to claim 5 in which said closure means is constituted by a pair of rectangular flaps which extend from opposite sides of the carton and are dimensioned to enclose said one of said ends completely.

7. A method according to any one of claims 1 to 6 in which the other of said ends of the carton is provided with closure flaps.

8. A method according to any one of claims 1 to 7 in which the articles in each of the layers are located in the cells of dividers formed of structural honeycomb material, and the article supports are layer pads.

9. A method according to claim 8 in which each layer of articles, its divider and its layer pad is provided in the form of an assembly and the assemblies are conveyed, as such, to the carton in succession.

10. A method according to claim 9 in which the layer pads are rectangular pieces of card material and at least one of the edges of each layer pad which runs in the expansion direction of the divider is upturned to form a flange.

11. A method according to claim 10 in which some of the articles of the layers are located in incomplete edge cells of the dividers and retained therein by the flanges.

12. A method according to either of claims 10 or 11 in which the layer pads are drawn in turn from a supply of flat card and conveyed to a fitting station, the flanges are formed during said conveying and the dividers are drawn in turn from a supply of dividers in the unexpanded state and expanded and fitted upon the flanged dividers at the fitting station.

13. A method according to any one of claims 1 to 12 in which descent of the jack means is opposed by a resilient loading.

14. A method according to any one of claims 1 to 12 in which the jack means is raised pneumatically.

15. A method of forming a package of the kind in which articles are positioned in layers in a carton substantially as hereinbefore described and illustrated by reference to the accompanying drawings.

16. Apparatus for forming a package by a method according to any one of claims 1 to 14.